April 2, 1935. E. A. LOWE 1,996,478

FIRE EXTINGUISHING APPARATUS

Filed Oct. 16, 1930 2 Sheets-Sheet 1

Fig. 1.

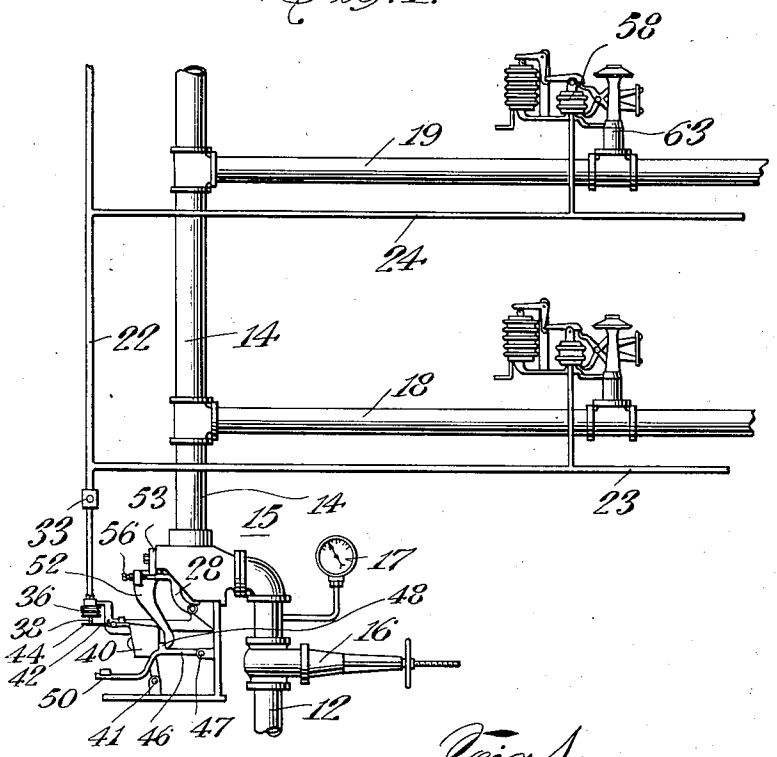
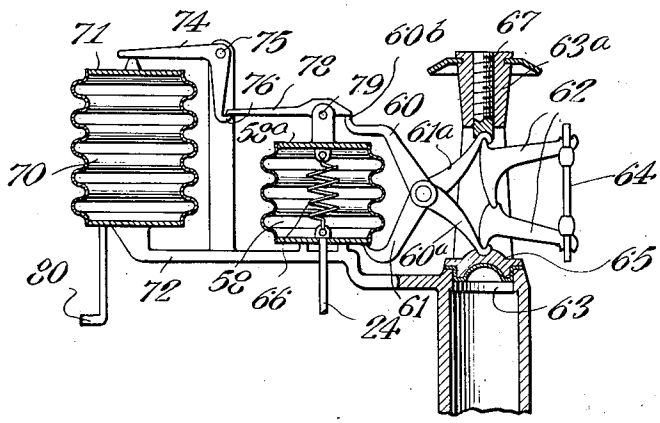



Fig. 4.




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Fig. 2.

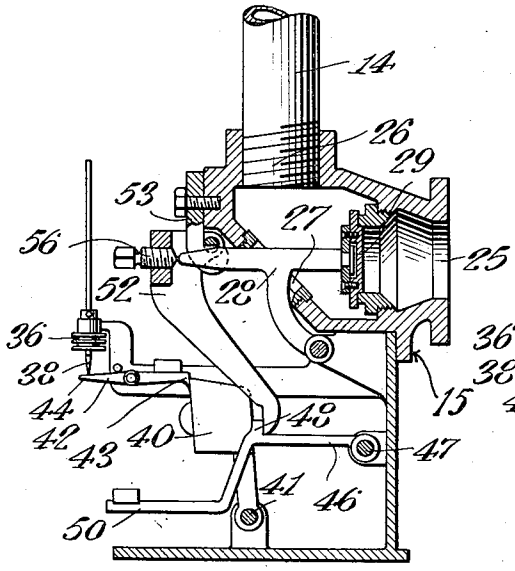
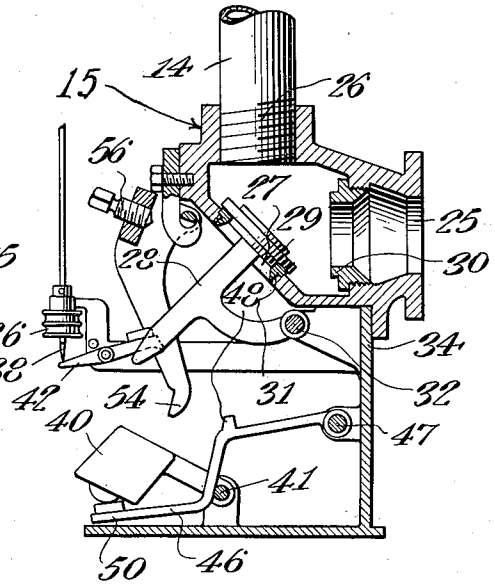



Fig. 3.




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Patented Apr. 2, 1935 1,996,478

# UNITED STATES PATENT OFFICE

1,996,478

## FIRE EXTINGUISHING APPARATUS

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Application October 16, 1930, Serial No. 489,012

5 Claims. (Cl. 169—19)

This invention relates to the art of fire extinguishing apparatus and is particularly applicable to the automatic dry-pipe system in which the fire extinguishing fluid is supplied to any of a number of protected fire sections or areas whenever a fire condition occurs in such section or area.

It is one of the primary obects of the invention to provide an apparatus of this type which will be rapid and unfailing in its operation and which responds readily and automatically to flood an area where a fire condition exists.

The invention contemplates further to provide for easily draining the pipe lines after the apparatus has been used and to allow air to circulate within the interior of the pipes to maintain them in a dry condition.

The invention will be described as applied to a system more particularly described and claimed in my co-pending application filed June 29, 1934, Serial No. 732,984, in which system a pressure producing element positioned in a fire zone and constructed to provide a relatively sudden pneumatic impulse for opening the main control valve of the system where there is a sufficient rate of rise of temperature adjacent the same, and in which the operation of the main valve is rendered certain by providing a fixed temperature device such that when this temperature is reached the impulse for opening the main valve is provided in any event.

The invention herein claimed will further be described as applied to a system also described and claimed in said copending case wherein I provide a normally closed outlet and automatic devices operating on a fixed relatively high temperature condition for opening the outlet and simultaneously supplying the pneumatic impulse required for opening the main valve, this feature assuring an opening of the main valve even though the preliminary devices do not operate.

Other objects of the invention will appear more fully from the following description when considered in connection with the drawings.

My present application relates more particularly to the construction of the main control valve and the means immediately combined therewith and responsive to the change of pneumatic pressure for unlatching or freeing the main valve. In the drawings:

Fig. 1 is a fragmentary view of a fire extinguishing system embodying my invention.

Fig. 2 is a sectional view of the main valve and release mechanism employed herein.

Fig. 3 is a view similar to Fig. 2 showing the valve in open condition.

Fig. 4 is a sectional view of one type of control for use in the fire zone to open the main valve and discharge outlet.

Referring now to the details of the drawings, there is disclosed a main water supply pipe indicated at 12 which connects with any desired number of risers or feed mains 14 (one such riser being shown in Fig. 1) leading away from the main valve head 15. It is preferred to provide a manual control valve 16 so that the supply of fire extinguishing fluid, water for example, may be manually shut off when desired, as during resetting of apparatus. For the sake of safety the pressure gauge indicated at 17 may likewise be installed on the water main adjacent its connection at the head 15 to indicate the available water pressure. From the risers 14 the required number of branch lines 18 and 19 extend into the different fire areas to insure a supply of water to all parts of the structure protected by the system.

In order to maintain the pipe lines including the risers and branch lines normally dry and subjected to atmospheric pressure, I have employed a main control valve 15 formed with an outside or drain opening of substantial size, normally unobstructed but closed on operation of the apparatus. With this construction no water will normally be present in the system outwardly of the head 15 and the risers and branch lines may therefore be installed in any unheated building without danger of the pipe becoming frozen in extreme weather.

The main valve 15 is constructed to be automatically operated upon the occurrence of a fire condition. To this end I have shown a separate impulse conducting conduit 22 extending from the main control valve 15 and connected with branch conduits 23 and 24 which lead to the various fire sections or areas. The conduits 22, 23 and 24 are formed of tubing and are normally subjected to atmospheric pressure by providing a restricted outside leak or opening 33 which is sufficiently large to maintain the interior of the conduit at substantially atmospheric pressure under normal atmospheric temperature and pressure changes but which is ineffective to relieve the pneumatic impulse utilized for operating the valve 15 as hereinafter fully described.

The main control valve 15 is constructed as shown in detail in Figs. 2 and 3. The valve casing includes the water inlet 25 and outlet 26 the former being connected to the water main 12

and the latter to the risers 14. Positioned between the inlet and outlet is an opening 27 which accommodates the operating support 28 for the valve closure 29. This closure is constructed to control the inlet 25 and also the opening 27 so that when the closure is moved away from the valve seat 30 of the inlet it is moved into engagement with the valve seat 31 of the opening 27 to close the interior of the head 15 and to permit the passage of water from the water main to the risers. This position of the valve closure is shown in Fig. 3. The opening 27 serves a further important function of permitting the system to be automatically drained when the main valve is closed and also of permitting the circulation of air within the supply pipes extending to and into the fire areas. The support 28 for the valve is shown as pivoted at 32 to a supporting structure 34 positioned without the valve casing 15.

The valve closure 29 is constructed to be controlled by an impulse preferably pneumatically transmitted through the conduits 23 or 24 and 22. In the form of the invention disclosed the pneumatic impulse is utilized to expand a partially collapsed bellows 36 to move the operating element 38 thereof outwardly. In order to insure instant and unfailing operation of the valve controlling mechanism it is preferred to store a considerable quantity of latent mechanical or other energy in the valve controlling mechanism which energy can be easily released to open the valve. To this end the valve controlling mechanism includes a weighted lever 40 pivotally supported as at 41 and which is normally retained in raised position (but in a position of unstable equilibrium) by means of a detent or latch 42. The latch 42 has one end 43 thereof engaged against the weighted lever 40 and the other end 44 positioned to be engaged by the movable element 38 of the bellows 36. The locking lever 46, shown as pivotally supported at 47 on the supporting structure 34, includes a locking lug 48 and an operating extension 50. The extension 50 is positioned to be engaged by the weighted portion of the lever 40 when the latter swings downwardly due to the force of gravity. A valve control lever 52 is pivotally supported from the valve head as by means of the bracket 53 and includes a locking extension 54, constructed to engage the lug 48, and an adjustable set screw or stop member 56 which engages the operating rod 28 of the valve to hold the latter normally in closed position against the valve seat 30. The adjustable stop member 56 permits the valve closure 29 to be accurately closed when the lugs 48 and 54 are in engagement.

By this construction it will be seen that upon a pneumatic impulse being transmitted through a conduit 22, 23 or 24 to the bellows 36 the member 38 is moved against one arm 44 of the latch 42 to release the weighted lever 40 which thereupon falls by gravity against the operating extension 50 of the retaining lever 46 releasing the latter from engagement with the control lever 52, thereby permitting the valve closure 29 to move from closed to open position, that is, from the valve seat 30 to the valve seat 31 to permit the passage of the fire extinguishing fluid from the water mains toward the discharge outlets.

Referring now to the devices illustrated in detail in Fig. 4 and which serve to supply the pneumatic impulse required for opening the main valve, these devices as shown include a collapsible bellows 58 normally held in expanded position by means of the toggle levers 60 and 61 having one pair of arms thereof extending above and below the bellows, the other ends 60*a*, 61*a*, herein termed the jaws, being normally held spaced by means of the coacting levers 62 which engage against one another and against the interior of the jaws 60*a*, 61*a*. The levers 62 are normally prevented from separating to permit the collapse of the bellows 58 by a temperature responsive structure shown as a fusible element 64 connecting the outer or free ends of the levers 62.

In the form of the invention shown the discharge outlets 63 of the branch lines 18 and 19 are normally closed by means of the displaceable closures 65 held in place by the levers 62 coincidently with the spreading of the levers 60 and 61. The jaws 60*a* and 61*a* of levers 60 and 61 are positioned between the closure 65 and the element 67 shown as an adjustable set screw carried by the sprinkler head 63*a*. The spring member 66 shown as positioned within the bellows 58 is normally under tension and when the levers 60 and 61 are released by reason of fusion of the element 64 or otherwise the bellows is collapsed by means of the spring 66 permitting the displacement of the closure 65 and creating the pneumatic impulse in the conduit 24 required for operation of the bellows 36 and valve mechanism 16. The fluid discharged from the outlet 63 may be caused to assume the form of a spray by means of any preferred form of sprinkler head 63*a*.

For the purpose of supplying a pneumatic impulse for opening the main valve where a predetermined rate of rise of temperature occurs but without reference to the actual temperature present there is employed in association with the bellows 58 a rate of rise device comprising a heat absorbing expansible element shown as a bellows 70 attached to a bracket 72. A bell crank lever 74 pivoted at 75 is engaged with the upper or movable wall 71 of the bellows 70, the lower or free end of the lever 74 being formed with a projection 76 normally engaged with and holding a retaining lever 78 pivotally supported at an intermediate point as indicated at 79 to an extension formed on the upper movable wall 58*a* of the compression device or bellows 58. The end of the lever 78 opposite the bell crank lever 74 bears in supported relation against the end 60*b* of lever 60, the levers 74 and 60 supporting the link 78 with the compression device 58 expanded as shown in Fig. 4. In order to prevent normal changes in the temperature or pressure conditions adjacent the element 70 from releasing lever 78 the interior of element 70 communicates with the outside air through a leak as shown at 80, the function of this restricted opening being to permit the passage of small quantities of air to or from the interior of the element 70 but on any substantial rise in the temperature at a rapid rate such as results from an abnormal rate of change due to fire, the opening 80 is insufficient to accommodate the pressure change within the bellows 70 and it is expanded to elevate the movable wall 71 for the purposes appearing more fully below.

In the use of the above controlling devices the parts are normally retained in the position shown in Fig. 4. On the occurrence of a fire producing a relatively rapid rate of rise of temperature adjacent the element 70 the pressure produced therein elevates the wall 71 thus disengaging the projection 76 from the lever 78. This permits the spring 66 to collapse the bellows 58 and to send

a pneumatic impulse through the tubing 24 to the pressure responsive element 36 for opening the main valve. This operation however does not produce the opening of the outlet 63 but instead the levers 60, 61 and 62 remain in their original condition with the outlet closed. If thereafter a sufficient heat is developed to fuse the link 64 the outlet is then opened and the fire extinguishing fluid, previously supplied adjacent the outlet 63 through the opening of the main valve, is permitted to escape and to extinguish the flame. In case the fire is not large or extensive, that is of such a character that the increase in temperature is insufficient to actuate the heat responsive element 70 to operate the bell crank lever 74 the main valve remains closed until the link 64 is fused on the attainment of the predetermined relatively high heat condition at whatever rate attained and due to prolongation of the fire. The fusing of the link 64 under these conditions causes the levers 60 and 61 to become free of the holding effect of the levers 62 and as a result the extension 60b recedes from the end of the lever 78 and permits the spring 66 to compress the pressure producing device as previously explained.

By means of the above described devices mechanism is provided to produce a relatively strong pneumatic impulse for opening the control valve on the occurrence of a rapidly increasing fire resulting in a predetermined rapid rate of rise of temperature such as will open the bellows but in any event when a fixed abnormally high temperature is reached which may be ineffective upon bellows 70, then the fluid outlet in the fire zone is opened and the pneumatic impulse is forwarded for opening the main valve.

It will be understood that the specific embodiment of the invention herein disclosed is merely illustrative and that variations may be made therein without departing from the spirit of the invention.

The means hereinbefore described for generating the pneumatic impulse which is supplied to the pneumatic pressure responsive means immediately associated with the main control valve form the subject of claims in my co-pending application filed June 29, 1934, Serial No. 732,984 and are therefore not claimed herein.

This application is a continuation in part of my prior application, Serial No. 68,283, filed November 11, 1925.

Having now described my invention, I claim:

1. In a dry-pipe fire extinguishing apparatus, a fluid supply valve casing provided with an inlet opening and a drain opening, valve closure means constructed to close either of said openings, an operating extension connected to said closure means and extending from within said casing outwardly through said drain opening, means without the casing normally engaging said extension to hold the closure means in inlet closing position and releasing devices responsive to increase of fluid pressure acting thereon and co-operating with said engaging means to free the extension and permit the closure to move from inlet closing position.

2. In a dry-pipe fire extinguishing apparatus, a fluid supply valve casing provided with an inlet opening and a drain opening, valve closure means constructed to close either of said openings, an operating extension connected to said closure means and extending from within said casing outwardly through said drain opening, mechanical latching means positioned without said casing for normally maintaining said closure means in position to close said inlet opening, and a pneumatic releasing means for said latching means outside of said valve casing responsive to increase of pneumatic pressure applied thereto in consequence of a fire.

3. In a dry-pipe fire extinguishing apparatus, a fluid supply valve casing provided with an inlet opening and a drain opening, valve seats adjacent said openings, a valve formed with a clapper constructed to cooperate with either of said valve seats and movable to position to close said inlet opening or said drain opening, means holding the valve in inlet closing position and means for controlling the position of said valve including an expansible device normally contracted under atmospheric pressure and expanded by an increase of pressure due to fire conditions for releasing the valve from its inlet closed position.

4. In a dry-pipe fire extinguishing apparatus, a fluid supply valve casing provided with an inlet opening and a drain opening, valve closure means constructed to close either of said openings, a controlling shaft operatively associated with said closure means, a latch engageable with said shaft for normally maintaining said closure means in position to close said inlet opening, and means for controlling said latch including an expansible device normally contracted under atmospheric pressure and expanded by an increase of pressure due to fire conditions for releasing the latch.

5. In a dry-pipe fire extinguishing apparatus, a valve casing formed with an inlet opening and a drain opening of substantially the same size, a movable closure positioned within said casing and constructed to close either of said openings, means holding the closure in inlet closing position, means for supporting said closure during its movement from one of said openings to the other and means including a bellows having a bleeder opening maintaining the same normally under atmospheric pressure said bellows adapted to receive and operate under rapid increase of pressure for releasing said closure from its position closing the inlet and permit said closure to close said drain opening.

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